

Remarks

Claims 1-34 are pending in this application. In view of the foregoing amendments and the following remarks, reconsideration and allowance of all the rejected claims are requested.

In the Drawings

Applicants acknowledge the Examiner's acceptance of the drawings filed on December 16, 2003.

Information Disclosure Statement

Applicants thank the Examiner for considering the references submitted on May 19, 2004, as evidenced by the signed and initialed Form PTO-1449.

Rejection Under 35 U.S.C. § 112

Claims 5, 7, 15, 22, 24, and 31 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite. These claims are amended to replace "distance" with "difference." Support for this amendment is found at least on page 23, paragraph 00084. The Examiner is respectfully requested to withdraw this rejection.

Rejection Under 35 U.S.C. § 102

Claims 1, 2, 11-19 and 28-34 are rejected under 35 U.S.C. 102(e) as being anticipated by Ina et al. (USP 6,559,924). Applicants respectfully traverse this rejection on the following basis.

Independent claim 1 recites an alignment system that is configured to obtain position invariant information from light affected by the substrate and to determine, based on the position invariant information, a correction to the determined position of an alignment structure, among other things. Claim 14 recites an alignment system configured to measure properties of light affected by the alignment structure, to determine a position of the alignment structure relative to the patterning structure based on the measured properties, among other things. Claim 18 recites a device manufacturing method that includes determining a position, relative to the patterning structure, of an alignment structure having

spatially periodically variable optical properties, wherein the position is determined during alignment using both positional information from light affected by a substrate having the alignment structure and position-invariant information from the light affected by the substrate, among other things. Claim 30 recites a device manufacturing method that includes determining the position includes applying a model during alignment that describes physical properties of the alignment structure as a function of the position, estimating a value of a parameter of the model that corresponds to at least one of the measured properties, and determining a correction to the determined position based on the estimated value, among other things.

Regarding independent claims 1 and 18, the examiner alleges that “Ina further discloses the alignment system being configured to obtain position invariant information from the light affected by the substrate and to determine based on the positional invariant information (see col. 10, lines 16-41)” (see paragraph number 4 on page 3 of the August 5, 2005 office action). The cited portion of Ina et al. discloses that the offset analyzer has information necessary for managing an apparatus error (TIS) between its detection system and the alignment scope of the exposure apparatus. However, Ina et al. explicitly discloses that the offset analyzer is a system that measures the surface shape *outside the alignment apparatus, i.e., outside the exposure apparatus with a profiler with no contact possibility and a profiler with contact possibility before and after resist coating* (see Ina et al., col. 9, lines 27-35). Thus, Ina does not disclose or suggest an alignment system that is configured to obtain position invariant information from light affected by the substrate and to determine, based on the position invariant information, a correction to the determined position of an alignment structure nor a device manufacturing method that includes determining a position, relative to the patterning structure, of an alignment structure having spatially periodically variable optical properties, wherein the position is determined during alignment using both positional information from light affected by a substrate having the alignment structure and position-invariant information from the light affected by the substrate.

Regarding independent claims 14 and 30, the examiner alleges that “Ina et al. teaches the alignment system including a model equation/Maxwell’s equation, describing at least one positional dependent optical effect of the alignment mark (see col. 12, lines 23-32)” (see paragraph number 4 on page 3 of the August 5, 2005 office action). This portion of Ina et al.

discloses a simulator in the offset analyzer. As discussed above, Ina et al. explicitly discloses that the offset analyzer is a system that measures the surface shape *outside the alignment apparatus, i.e., outside the exposure apparatus with a profiler with no contact possibility and a profiler with contact possibility before and after resist coating* (see Ina et al., col. 9, lines 27-35). Thus, Ina does not disclose or suggest an alignment system configured to measure properties of light affected by the alignment structure, to determine a position of the alignment structure relative to the patterning structure based on the measured properties nor a device manufacturing method that includes determining the position includes applying a model during alignment that describes physical properties of the alignment structure as a function of the position, estimating a value of a parameter of the model that corresponds to at least one of the measured properties, and determining a correction to the determined position based on the estimated value.

Since Ina et al. neither discloses nor suggests the invention claimed in independent claim 1 and its dependent claims 2 and 11-13, or the invention claimed in independent claim 14 and its dependent claims 15-17, or the invention claimed in independent claim 18 and its dependent claims 19, 28 and 29, or the invention claimed in independent claim 30 and its dependent claims 31-34, these claims clearly are not anticipated by Ina et al. For the foregoing reasons, reconsideration and allowance of these claims is requested.

Claims 14-16, 30-32 and 34 are rejected under 35 U.S.C. 102(e) as being anticipated by Koren et al. (US 2004/0130690 A1). Applicants respectfully traverse this rejection on the following basis.

Claim 14 recites the feature that the alignment system includes a model describing physical properties of the alignment structure as a function of position and wherein the alignment system is arranged to estimate a value of a parameter of the model that corresponds to at least one of the measured properties and to determine a correction to the determined position based on the estimated value, among other things. Claim 30 recites the feature of wherein determining the position includes applying a model during alignment that describes physical properties of the alignment structure as a function of the position, estimating a value of a parameter of the model that corresponds to at least one of the measured properties, and determining a correction to the determined position based on the estimated value. In an exemplary embodiment, a parameterized model is provided that characterizes physical

properties of the alignment structure as a function of position in the alignment structure (see the specification at page 14, paragraph 0055). According to another exemplary embodiment, the corrections are determined by searching for the values of the parameters that lead to predicted intensities that best fit the measured amplitudes, followed by selection of the corrections that correspond to the selected parameters (see the specification at page 15, paragraph 0056).

The examiner alleges that Koren et al. discloses “an alignment system [that] includes a model/equation, describing the physical properties of the alignment structure (see sections [0105] – [0108])” (see paragraph number 5 on page 4 of the August 5, 2005 office action). The cited portion of Koren et al. is directed to calculating a weighting factor for combining signals at two wavelengths as a function of the measured signal strength (see Koren et al. at paragraph 0105). The signal strength is corrected for the (relative) reflectivity of the materials on the wafer surface to ensure an optimal combination of the wavelength channels. However, Koren et al. fails to disclose or suggest at least that the alignment system includes a model describing physical properties of the alignment structure as a function of position and wherein the alignment system is arranged to estimate a value of a parameter of the model that corresponds to at least one of the measured properties and to determine a correction to the determined position based on the estimated value or wherein determining the position includes applying a model during alignment that describes physical properties of the alignment structure as a function of the position, estimating a value of a parameter of the model that corresponds to at least one of the measured properties, and determining a correction to the determined position based on the estimated value.

Since Koren et al. neither discloses nor suggests the invention claimed in independent claim 14 and its dependent claims 15 and 16, or the invention claimed in independent claim 30 and its dependent claims 31, 32 and 34, these claims clearly are not anticipated by Koren et al. For the foregoing reasons, reconsideration and allowance of these claims is requested.

Rejection Under 35 U.S.C. § 103

Claims 3-10 and 20-27 are rejected under 35 U.S.C. 103(a) as being obvious over Ina et al. in view of Nomura et al. (USP 5,969,428). Applicants respectfully traverse this rejection on the following basis.

In rejecting dependent claims 3-10 and 20-27, the Examiner acknowledges that “Ina et al. does not expressly disclose [an] alignment system having a model describing at least one position-dependent optical effect of the alignment mark to estimate a value of a parameter of the model corresponding to at least one of the measured intensities” (see paragraph number 7 on page 5 of the August 5, 2005 office action) and relies on Nomura et al for disclosing this feature. It remains, however, that the above-quoted portion is merely a part of dependent claims 6 and 23, wherein the remaining part of these claims is not addressed by the examiner. Assuming, *arguendo*, that Nomura et al. discloses this feature, claims 6 and 23 are distinguished over Ina et al. and Nomura et al. because they recite additional features that are not disclosed by these references. Furthermore, the examiner fails to address the feature of remaining dependent claims 3-5, 7-10, 20-22, and 24-27. For at least this reason, applicants respectfully submit that the examiner has failed to establish a prima facie case of obviousness.

In any event, claims 3-10 and 20-27 depend from corresponding ones of independent claims 1 and 18 and therefore include the above recited features of independent claims 1 and 18. Koren et al. fails to teach or suggest the deficiencies of Ina et al. as discussed above. Thus, Ina et al. and Koren et al. remain deficient both alone and in combination with each other. In view of the foregoing, claims 3-10 and 20-27 are not rendered obvious over the combination of Ina et al. and Koren et al. Reconsideration and allowance of these claims is requested.

Claims 17 and 33 are rejected under 35 U.S.C. 103(a) as being obvious over Koren et al. in view of Chen et al. (USP 6,064,486). Applicants respectfully traverse this rejection on the following basis.

Pursuant to 35 USC 103(c), Koren et al. does not qualify as prior art because Koren et al. and the claimed invention were, at the time the invention was made, subject to an obligation of assignment to the same entity (ASML Netherlands B.V.). As such, applicant respectfully requests the examiner to withdraw this rejection.

While invoking the prior art exemption under 35 USC 103(c), applicant preserves the right to distinguish over Koren et al. and Chen et al., if necessary.

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Reply and Amendment Under 37 C.F.R. §1.111

If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

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Respectfully submitted,

A handwritten signature in black ink, appearing to read "Sean L. Ingram", is written over a horizontal line.

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